

ROCKS and MINERALS

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PETER ZODAC

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ROCKS and MINERALS

PEEKSKILL, N. Y., U. S. A.

The Official Journal of the Rocks and Minerals Association

Chips from the Quarry



PETER ZODAC

We Repeat Ourselves

Our editorial in the May issue of **ROCKS AND MINERALS** has created considerable discussion, mostly favorable. Many of our members have written us about it—some commending, most emphatically, upon our stand; a few being against it. A number seemed to be distressed believing we had singled them out, individually, to base our editorial. The most encouraging letters received, however, were from those members who took the editorial at its face value. These members made an honest survey of their collections and—threw out every specimen which they felt was under par. Some of these latter members even purchased specimens from dealers to compare with those in their collections. Wrote one member: "I purchased a \$1.00 specimen of Alaska epidote as I had many specimens of local origin which were thought to be very good. But on comparing them with the Alaskan specimen they were so thoroughly outclassed that the entire lot was thrown away."

Our editorial was not printed to

criticize nor condemn specimens in amateur collections in general nor any one collection in particular. It was printed to call attention and to remedy a most distressing condition that seemed so prevalent among amateur collectors. As editor of America's oldest nontechnical mineral magazine and after examining hundreds of amateur collections and interviewing a large number of advanced collectors, we are in a far better position to know something about mineral collections throughout the country than some private individual who may have only a few mineralogical friends to compare notes with.

ROCKS AND MINERALS, always the leader in its field, announced the result of our survey and will continue to hammer away at poor collections. The slogan of every collector should be: "Nothing but the best should go into my collection."

Mineral clubs should strive to have their members collect good specimens. At the end of every meeting and especially at those meetings when members relate some of their collecting experiences and have some of the collected specimens on display, the presiding officers should ascertain if any "rank amateur collectors" are present. If such collectors are present, they should be told something as follows:

"We are very glad to have you with us at this meeting and we hope you will attend many of the future meetings which this club shall hold and that if you are not already a member that you will become one before many weeks pass by. Membership in the club has many advantages, one of which is to listen to collecting experiences as related by our members.

(Continued on page 221)

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MINERALS USED BY THE INDIANS FOR MAKING ARROWPOINTS

By FRED DUSTIN, Saginaw, Mich.

Many years ago I read an article, "The Stock-In-Trade of an Aboriginal Lapidary," by Charles Rau, which appeared in the Report of the Smithsonian Institution for 1877. After relating the incidents of the discovery of four hundred and sixty-nine objects fabricated from jasper, he described them, and said: "There can hardly be any doubt that the deposit constituted the stock-in-trade of some aboriginal manufacturer of ornaments of jasper, which he made from pebbles of that material." From time to time other papers on the subject of minerals used by the Indians in their manufacture of artifacts came to my notice, and as I had collected a large number of arrowpoints, drills, pipes, axes and other objects of prehistoric make, I had seen that a variety of material was used, and even stone of gem quality, such as agate, chalcedony, basanite, and rock crystal had been utilized in fabricating various weapons and implements. My interest in the subject increased and resulted in a short paper¹ read before the Section of Anthropology of the Michigan Academy of Science, but as

this dealt with materials in general, Dr. Wilbert B. Hinsdale, of the University of Michigan, suggested that a paper be written on arrowpoints alone, and that a set of type materials be prepared and properly labeled, so that the frequent inquirers who asked the question, "What is this arrowpoint made of?" might be answered with reasonable accuracy. This I have hoped to do, and this paper may be a basis for an attempt to follow Dr. Hinsdale's wishes.

It occurred to me many years ago, that in the extensive territory covered by the United States, certain minerals used by the Indians were strictly local and not of widespread occurrence, although trade and migration accounted for the great distribution of native copper of Michigan, catlinite from Minnesota, and perhaps other materials collected in the form of arrowpoints long distances from the place of their origin. To secure this localized material such as novaculite, I advertised in certain "hobby" magazines, offering to exchange arrowpoints of characteristic Michigan minerals for similar artifacts from the several states. The response was pleasing in general, and I obtained a goodly representative collection from

¹ Dustin, Fred, *Materials of the Indian Lapidary in the Saginaw District*, Pap. Mich. Acad. Sci., Arts and Letters, 8 (1927): 11-22, 1928.

all parts of the country, and have had a satisfactory correspondence with many amateur archaeologists. With only two exceptions, I did not appeal to any professional: in one case, wishing to obtain a sample of material from Mt. Kineo, Maine, I wrote to a noted authority: his first reply was in substance that he was unable to understand why anyone should wish to collect arrowpoints from each state in the union, but when I wrote him a second time, and stated my purpose, he was very sympathetic and put himself out to furnish the desired samples.

On the basis of these exchanges, together with a large amount of literature on the subject, this paper has been prepared. It is not as complete as might be wished, but it will at least be a starting point for some one competent to make a more accurate study.

There is one mineral, chalcedony, which, in its various forms, occurs in every state of the Union. It may be roughly divided into translucent and opaque: the first, characteristic of that formed in igneous rocks; the second, occurring in sedimentary formations. In the former we find such gem minerals as agate, plasma, carnelian or sard: in the last, chert, while jasper is common to both, for it seems to be a sort of hybrid, sometimes the result of metamorphic changes, or, not infrequently, of apparent concretionary origin. Owing to the prevalence of sedimentary rocks east of the Rocky Mountains, chert is the characteristic material in that part of the country, while west of, and in the Rocky Mountain region, the gem forms of chalcedony together with obsidian, were largely used by the aborigines. It seems probable that from eighty to ninety per cent of the arrowpoints

made by Indians were of minerals having a hardness of about 7 on the Mohs scale, with silica as a chief constituent, while obsidian, hardness close to 6 and partly composed of feldspar, made up a large part of the remainder.

The Indian lapidary had learned that there were certain essential qualities needful in the stone used for chipped artifacts, namely; easy flaking, toughness and hardness. Obsidian possessed the first in high degree, while chalcedony in its several forms had the three, although some varieties were rather brittle, and perhaps it was for this reason that other materials were sometimes used, even where chert was abundant, as in the Saginaw region. This paper being a general survey, special minerals will receive no more than a casual mention unless there is an extended use in a not too restricted territory.

Through my exchanges, I secured type-material from thirty-six states exclusive of Michigan, consisting of about five hundred arrowpoints or similar artifacts. Every Atlantic state is represented except Massachusetts and Rhode Island; all the Gulf states except Louisiana; all those bordering on the Mississippi River except Iowa and Minnesota; the three Pacific states, and all of the interior states not mentioned except six.

Nearly all of my correspondents who sent exchange material were intelligent collectors, so that most of the artifacts received were authenticated both as to locality and type minerals, and I am indebted to many of them for their description of localities and other useful information.

* * *

Materials

CHERT

There is one mineral, chert, which seems to have been used in nearly all

parts of the United States; in the New England and Middle States it is largely of the common gray type, although in some sections much of it is a dull black, due to carbonaceous inclusions or coloring. It is free-chipping, the fracture sub-conchoidal, and so far as the collection indicates, rarely of nodular formation, having been deposited in veins and layers. It seldom approaches even a sub-translucency, only about one point in forty showing that character. These general characteristics continue southward through the Atlantic coast states until southern Georgia and Florida are reached, where a white or cream-colored stone, with patches of translucent chalcedony, becomes plentiful, a quite pure product of the Florida limestone, sometimes resembling the novaculite of Arkansas. Through the Gulf States westward through Texas, the gray chert gives place to a finer quality, yellow or reddish in color, but still showing the sub-conchoidal fracture. This is also true of much of the lower Mississippi Valley including Kentucky and Tennessee.

Westward from Pennsylvania, through Ohio, Indiana and Illinois, we find chert which often grades into agate, pure chalcedony, jasper or other gem-like minerals, with a minimum of the common gray variety. At Flint Ridge, the noted locality in Ohio, it lies in massive layers ranging from a fine translucent bluish chalcedony through many shades of color to carnelian red and other tints, too fine to be called chert, yet so plentiful as to deny it the title of gem.

In Indiana, beautiful cream-colored chert occurred, and had quite a wide distribution, but it was in Illinois that this stone was found in a quality and quantity that puts it in the first rank, for the perfect conchoidal fracture,

with a fine, waxy luster, has as strong an attraction for the archaeologist as it had for the aborigine who fashioned his weapons and implements from it. At several points it was quarried in great quantity from the interrupted layers in the limestone, and was distributed over a considerable extent of territory.

The remaining states of the Mississippi Valley, especially those of the middle group, produced large supplies of nodular chert, much of it of fine quality, which on account of its toughness, translucency, and peculiar luster, has often been called hornstone.

The chert of Michigan has been described at some length² in a paper recently published, which may be summarized by saying that it occurs in nodules, hence its surface appearance as exhibited in artifacts or rough flakes, indicates by concentric lines of formation, its concretionary genesis. At least ninety per cent of the arrow-points collected in the Lower Peninsula are of local origin. Nearly all are of the common gray type, although occasionally one is found of purer material from the chief sources of supply, while in very restricted locations, artifacts of pure chalcedony, translucent and of fine waxy luster, were secured.

Wisconsin also had a plentiful local supply originating in the long limestone ridge extending south from Green Bay parallel with the shore of Lake Michigan, and from other outcrops elsewhere. It was similar in quality to that of Michigan.

Proceeding westward to the Dakotas and Montana, we find a chert that in appearance is more like slate, although its hardness is at least

² Dustin, Fred. *A Study of the Bayport Chert*. Pap. Mich. Acad. Sci., Arts and Letters, 20 (1934): 465-475. 1935.

6.5, and some of it cannot be scratched by pure quartz: the fracture is sub-conchoidal and the color gray or dull blackish with much ochre-yellow in seams or thickly impregnating the stone with yellow specks.

In the Rocky Mountain territory, as well as the Pacific States, there seems to have been a fair supply of chert of good quality, for my collection includes a good number of specimens from most of the states of that region, indicating a widespread use, but the literature is very scant. It remains for local archaeologists to give further light on the subject.

FLINT

The term "flint," or "flints" as commonly used by people in general, designates all arrowpoints and similar artifacts regardless of the mineral from which they are made. It is a very loose term quite naturally derived from our English forbears, but by them only referring to that form of chalcedony found so plentifully in the chalk beds of England, France and other European countries. It came to America with the first settlers as a very necessary article in the use of firearms, for the "flintlock" of our fathers could not be used without it, and a considerable business existed in England and on the continent, in the manufacture of gun-flints, as well as the articles known as "flint and steel," used for lighting fires. Flint being a fairly pure form of silica, and possessing a peculiar toughness, was especially adapted to the purposes named, and until percussion caps came into use, great quantities were imported from England, and in colonial days, passed current for an English penny, while round moulded musket balls were passed from hand to hand as farthings. While "flints" may have been manufactured from the common

chert of this country, I have not found any record to that effect, although it seems from the literature of the early period, that occasionally it happened that a hunter, losing the flint from his gun, would chip out a rough substitute from a bit of chert or other form of silica.

Mineralogists inform us that true flint is formed as nodules in a chalky limestone, and according to Dana³ "consists largely of the remains of infusoria (Diatoms), sponges, and other marine productions." About forty years ago, true flint of the above description was found in Arkansas and Texas in Cretaceous strata. It is not unusual for the collecting archaeologist to find an arrowpoint, scraper or cutting-blade on a Michigan field which in appearance closely resembles the English gun-flint that possibly he has picked up near it: both are of a dull, waxy luster, semi-translucent, and to all appearances the same material, but the former may be of local origin without any of those peculiar constituents that designate flint as a somewhat distinct mineral.

So far as known at present, it does not occur in this country except in the two states named.

QUARTZITE

Quartzite is usually considered to be a metamorphic rock, sandstone, that has been subjected to sufficient heat to completely or partially fuse it, but there are quartzites that appear to have been formed by a silicious solution cementing sandstone, thus consolidating it. In the first state, it at times approaches glass in its transparency, ranging from that condition to a sugary appearance, which is also characteristic of that which has been

³ Dana, James Dwight, *A System of Mineralogy*, Comprising the Most Recent Discoveries. Eighth Edition, 1888.

consolidated by the cementing process. In many parts of the country there are great masses of this mineral, which was quite largely employed by the Indians in making arrowpoints, spears, scrapers, mauls and hammers, its toughness being a very desirable quality, although unless it approached a state of solidity, it did not flake well. Where better materials were not plentiful, it was an important source of supply to the Indian lapidary, and in Michigan, where in the Lower Peninsula it only occurs as field or river boulders, many articles were made from it.

From Pennsylvania southward through the mountainous region, there are many large outcrops of quartzite, ranging in purity from a substance almost like rock crystal, having a good conchoidal fracture, to a coarse, sugary form, nearly opaque and difficult to flake. Its colors vary from a pure white or glassy appearance to pink, reddish, brown, gray, purple to even green. In my own collection it is especially prominent from Virginia, North Carolina, South Carolina and Georgia.

FELSITE

The term felsite seems to be a rather indefinite designation of a rock or rather, several feldspathic rocks, and the substance is not a true mineral, but a combination of several, of which silica is the most prominent, and gives the material a hardness and ease of flaking that made it a valuable article to the aborigine. So far as I have been able to learn, this rock was not much used by the Indians except in one very notable case. Concerning its composition, Geikie says: "Felsite (Felstone).—Under this name a large

series of rocks have been grouped which appear for the most part to have been originally vitreous lavas like the rhyolites, but which have undergone complete devitrification, though frequently retaining the perlitic, spherulitic, and flow-structures. They vary in color from nearly white through shades of gray. . . . They are close-grained in texture, often breaking with a sub-conchoidal fracture and showing translucent edges." Geikie also states (page 268 of the volume cited) that the name of "hornstone" has sometimes been applied to fine flinty forms of felsite. The description which he gives above, corresponds closely with the samples I have from the New England States, where it is of common occurrence in the form of arrowpoints, originating at Mt. Kineo, Maine, where it forms a large mass.

CRYSTAL AND VEIN QUARTZ

It is doubtful if there is any other form of silicious mineral that is as widespread in its use and occurrence as crystal and vein quartz. It is not meant by this that it was used in great quantities like chert, but that there was hardly a state in the Union where it was not employed in the arrow maker's art. Its beauty appealed to the Red Man as it appeals to us, and while it is not probable that in those localities where it was scarce, he used points made from it in ordinary hunting, he undoubtedly treasured it as a gem, and may have even used it ceremonially at times, for in the Appalachian region, crystals and artifacts of water-clear quartz have been found in graves and other situations which would indicate that it possessed great attractions.

In discussing quartzite, I mentioned its plenitude in the states of Virginia, North and South Carolina and

⁴ Geikie, Sir Archibald, F.R.S., *Text-Book of Geology*, 4 vols., N. Y., 1902. Pages 280-281, Vol. 1.

Georgia, and from some additional information, I would add Alabama to that number as producing much vein quartz and rock crystal. Once more quoting Geikie, page 268 of volume cited,—“Vein-Quartz may be alluded to here as a substance which sometimes occurs in large masses. It is a massive form of quartz found filling veins (sometimes many yards broad) in crystalline and clastic rocks; more especially in metamorphic areas.”

This description applies to many deposits in the five states named, and as a consequence, arrowpoints from this beautiful mineral are very prominent in any collection from that territory. In my own are many, all from the mountainous ridges which form the back country of the four South Atlantic States.

So far as known, no other part of the country had such a supply of vein quartz, although quartz in the crystal form was often used by the arrow-maker.

Vein quartz must not be confused with (in some cases) the very similar quartzite, or with that other form of silicious mineral, chalcedony: vein quartz might be compared to a huge crystal filling a cavity, great or small, although not showing a crystalline form outwardly, while chalcedony, even though so pure as to be limpid, was a very different mineral as to formation, being a crypto-crystalline form of silica, said by some mineralogists to contain a small percentage of opal, and slightly less in hardness than quartz and quartzite.

In the New England and Middle States, arrowpoints of rock crystal are not infrequently found; most of them were, no doubt, chipped from crystals which were plentiful in the pegmatites and some other rocks: occasionally one of smoky quartz, amethyst, or citrine is

collected, and of course highly prized by the archaeologist who is so fortunate as to secure it.

OBSIDIAN

Obsidian, like felsite, is not a mineral, for it is simply a lava of greatly varying composition, which has cooled so quickly that crystals did not have time to form. It varies in color from black to red or green of dark shades. The luster is vitreous (glassy), hardness about 6. It breaks with a conchoidal fracture, often in long splinters with very keen edges, and on account of these properties was much used by the Indians of the Rocky Mountain region, the Pacific States, and Mexico, for arrow and spear points, knives and other implements. Loomis⁵ says: “Obsidian is found in many localities, especially where there are recent volcanoes, the most famous places being the obsidian cliffs in the Yellowstone Park, those near Mono Lake in California, and many other localities in the Rocky Mountains, the Sierra Nevadas, and the Cascade Mountains.”

Some of the older writers tell us that the Mexicans used the long, keen-edged flakes for razors, making a single cut with each blade, and that some were very expert in striking off long, slender flakes with great rapidity.

On account of its abundance and accessibility, it was the characteristic material used for arrowpoints in the far west mountain and Pacific territories. Probably on account of its beauty and luster, it found its way eastward at least as far as Ohio, but only as a curio, for chert was far superior for every purpose except as a cutting instrument.

⁵ Loomis, Frederic Brewster, *Field Book of Common Rocks and Minerals*, (1923), p. 191-192.

Several states are represented in my collection, which includes a few very fine points, some of them serrated. They are all black or nearly of that color, although I have seen some mahogany red or somewhat brownish.

PITCHSTONE

Loomis⁶ says of pitchstone: "This is very like obsidian in appearance, but differs in that the glassy material contains from five to ten per cent of water in its composition, the most obvious effect of which is to make the luster resinous, instead of vitreous." He further states that it is associated with recent volcanoes, and that it is found in Colorado, Nevada and New Mexico. Like obsidian, it is a rock rather than a mineral, and the specimens I have seen, do not show either the perfect conchoidal fracture or the razor-edges of the former. I have no specimens from the localities of the states named by Loomis, or in fact from any other place than Isle Royale, Michigan, where I saw two or three arrowpoints and collected from a village site (prehistoric) some flakes. In Foster and Whitney's *Report*⁷ they say: "Pitchstone.—This mineral occurs in a large mass, in the trap of Isle Royale." One mass of pitchstone is on Scovill Point, not far from its northeast extremity. The volcanic rocks of which Isle Royale is mostly composed, are of very ancient periods, and the pitchstone shows no signs of devitrifying as far as I have seen. One little implement which I collected, a scraper, is sub-translucent in one or two places, the fracture varying from a slightly conchoidal to uneven, and of a peculiarly indescribable color, like resin mixed with a little tar with a bit of olive green thrown

in. It seems to be tougher than obsidian, but whether it was made use of to any extent by the aborigines of the west I have not learned, and as far as Michigan was concerned, the inaccessibility of Isle Royale, the difficulty of quarrying, and the fact that an inexhaustible supply of chert was available and easily procured, would not make the pitchstone of any importance. It was only the casual voyager or copper-miner, who plied his trade on that isolated isle, who might occasionally secure a small quantity and work it into arrow-points or scrapers.

NOVACULITE

Mineralogists are not in entire agreement as to the origin of novaculite⁸, but as to its composition, perhaps it is well described on page 467 of the work cited in note 8, as "a very fine-grained and compact rock consisting almost wholly of chalcedonic silica." It is white or pinkish, and from its peculiar character and appearance, we cannot wonder that there has been some disagreement in regard to how it originated. In my own collection I have a beautiful little white arrowpoint, picked up on a Saginaw County, Michigan, field a few years ago. I was long puzzled over its proper name as a mineral: while sub-translucent, it did not seem to be chalcedony, for unless held to the light, it appeared to be opaque: it had no luster, although it seemed to be entirely homogeneous: in the sunlight it showed a multitude of minute reflections, like an extremely fine-grained quartzite, but the fracture, sub-conchoidal, was entirely unlike quartzite. I have finally concluded

⁶ See p. 193 of work cited in note 5.

⁷ Foster, J. W., and Whitney, J. D., *Report of the Geology and Topography of a Portion of the Lake Superior Land District*, Part II, p. 106.

⁸ Merrill, George P., *Guide to the Study of the Collections in the Section of Applied Geology*: Report of the U. S. National Museum for the Year Ending June 30, 1899. (1901): p. 468.

that it is novaculite. In the paragraph cited in note 8, four different theories are advanced, any of which may be correct. To the mineralogist, the subject is of considerable interest and incidentally, to the archaeologist, for in wide territory centering at Hot Springs, Arkansas, novaculite was plentifully distributed in the form of arrow and spear points, as well as other artifacts. As it did not possess the showy qualities of obsidian or the mysterious properties of native copper, it is merely incidental that a point may now and then be collected several hundred miles from the place of its origin. In the latest issue available, that of 1917, of Bulletin 624, *Useful Minerals of the United States*, U. S. Geological Survey, we are informed that novaculite is found in "Arkansas, Georgia, Massachusetts, Michigan, North Carolina, Oklahoma, Tennessee." It is possible that my Michigan specimen is a product of this state. I have no information that the special types of novaculite named below, are produced commercially except in Arkansas, whence originate the "Arkansas" and "Washita" oil stones familiar to every carpenter or wood-carver.

GEM MINERALS-AGATE, CARNELIAN, JASPER, AND OTHERS

A gem is any stone of sufficient beauty and hardness to make it prized as a personal ornament. The American Indian, unlettered as he was, nevertheless had a profound love of Nature, and her works all had a strong appeal to his understanding, and like ourselves, he collected and treasured crystals, pretty stones, fossils and mineral oddities. The use of some of these in his rude arts, acquainted him with their properties, and he learned that the dull chert might grade into an agate; how frost and wave could loosen the jasper from its matrix, or

the lake beach yield the carnelian or crystal pebble. In those parts of the country where the finer forms of the silicious minerals were not plentiful, he chipped arrowpoints from the rare agates that came to his hand, and preserved them as choice relics, and when in upper Michigan, or down in Tennessee, we pick up a beautiful arrowpoint, that by its appearance and peculiarities we know came from Flint Ridge, we may not be sure whether it was brought hither by some Ohio Indian as an ordinary tip from one of his arrows, or whether a local red man, either on the war-path or visiting his related or friendly contemporaries, may not have collected and brought it home as a keepsake. When, however, we remove from an Ohio mound a glistening obsidian object, or in far-off Florida find in another mound a copper knife, we justly believe that it was through those qualities of unusual luster, substance or beauty, that it had been carefully treasured as a precious article, not to be used, but like the rare gem in some great museum, to be seen, studied and admired.

Arrowpoints of gem material are collected in every state: in some they are abundant; in others comparatively rare. Where great deposits are situated, as in Virginia and the Carolinas, in Arkansas and some of the Rocky Mountain states, they are plentiful, but in states like Michigan, Florida and Louisiana, they are scarce. In connection with the general subject, I have spoken quite fully of crystal and vein quartz, novaculite, quartzite, flint and obsidian, all, when of fine quality, to be classed as gems. It remains to say something of the finer chalcedonic forms of quartz including agate, carnelian, prase, plasma, and other varieties including jasper.

Jasper is widely distributed. Not far from Sault Ste. Marie, Michigan, but on the Canadian side, there is a large outcrop of jasper conglomerate. During the ice age, boulders of this rock were transported far southward, at least to Ann Arbor, Michigan. Some of them were large: one near St. Charles, Saginaw County, was about nine feet long, three feet wide and three feet high, and probably weighed seven or eight tons. I have seen a number that would weigh from a hundred pounds to twenty times that weight. The matrix is usually white or very light-colored, with a generous sprinkling of peculiar smooth, pure white or ivory white pebbles, and thickly dotted with those of several shades of red, brown, yellow, and black jasper. The whole was originally a great gravel bed which seems to have been consolidated by silicious waters percolating it, thus forming a solid rock. In some of our Michigan streams, the process of erosion has bared boulder beds, and from time to time disintegrating masses of this conglomerate or pudding-stone as it is frequently called, have left the bright, smooth fragments of jasper in the river beds, from which, especially the Cass River, that little stream whereon my summer camp is located, I have often collected them. These pebbles are never plentiful, and seldom large enough for an arrowpoint, although I have found a few of sufficient size for such use.

In igneous rocks jasper sometimes occurs in nodules of fair size, having been deposited much the same as the agates. In other situations it grades into argillite, the chief impurity, if such it may be called, being alumina, with a strong tinge of iron, giving it color. Another form of jasper, a metamorphic product, is often found

in quite large masses, and probably furnishes most of the material for arrowpoints of that mineral in certain sections.

It is in the extreme northwest, in Washington and Oregon, that the gem forms of chalcedony have been found in profusion as arrowpoints. In the volume, *Gems and Precious Stones of North America*,⁹ one of the colored plates shows four arrowpoints of gem material from the Columbia River, and the text gives brief descriptions, while in various publications, both of a technical and popular nature, much information can be gleaned, but perhaps all may be summarized by quoting from the Geological Survey volume, *Mineral Resources for 1891*¹⁰ and other years. From the 1891 report we read that "Mr. H. O. Stevens and others had found about 150,000 small arrow points on the beaches of the Willamette river at Oregon City, Oregon, between the years 1860 and 1890, principally in two places. One is on the east bank of the Willamette, 300 or 400 feet north of the bridge, where the banks are 15 to 30 feet high. . . . The other locality is what is known as Green Point, half a mile above the bridge, . . . there the banks have receded some 250 feet since 1861, and during the freshet of 1890 over 200 feet. . . . At both these places arrow points are gathered by boys and local collectors immediately after a freshet. In the debris of the river are to be found large quantities of broken fragments of obsidian, agatized wood, jasper, and other materials from which the arrow points

9 Kunz, George Frederick, *Gems and Precious Stones of North America*, New York, (1892): p. 65.

10 Kunz, George Frederick, *Precious Stones. Mineral Resources of the United States, Calendar Year 1891*, David T. Day, Chief of Division: Washington (1893): p. 551.

were made; also large diorite hammers, weighing from 2 to 10 pounds each. . . . Arrow points, equally fine, are found under similar conditions along the Columbia River."

These tiny "gem points" were often marvels of skill and ingenuity, many of them not over a quarter of an inch long, and showing wonderfully delicate chipping as well as beauty of material. They were readily sold for from 50c to \$5.00 each, and a considerable trade grew up at those localities where they were found, and again quoting from *Mineral Resources of the United States*, we are informed that up to 1905 about \$21,500 worth were sold and reported in that publication. It is probable that an equal amount was sold otherwise which never entered into the statistics given.

During the present century, a certain amount of spurious material has been manufactured, or rather the genuine has been counterfeited, by certain unscrupulous persons, who have, as far as skill is involved, turned out some very fine points.

Of the genuine points which were so much in demand years ago, many were set in gold mountings as stick-pins, watch charms and pendants, while some were simply drilled through the stem and suspended from the watch-chain or necklace.

Michigan is one of the states where little material of gem-quality was available to the Indian, and aside from an occasional chert nodule which shaded into a gray agate, an occasional lump of jasper or chalcedony from the drift, we find little of local origin: the pitchstone of Isle Royale was hardly fine enough to enter the class, and it is rare that a point of Lake Superior agate is found. In spite of this scarcity, my collection has contained quite a number of notable gem

points, but none of the tiny ones so characteristic of the Columbia River region. They include fine specimens of jasper, agate, chalcedony, dendritic chert, dark blue chert, lydian stone, plasma and a single exquisite point of snow-white novaculite, as well as other minerals, but as nearly all the collection is in our University Museum, I cannot describe it further than to say that with one or two exceptions, I collected it in the field during the past thirty years. Of interest in this connection, is a set of cut gems from rejected fragments and flakes of material used in arrowpoint making, the material for them having been gathered in the same manner that the gem points were secured. They are cut "cabochon," mostly, and form good illustrations of the possibilities of collecting minerals even in a region where a rock outcrop is a curiosity and a gravelly river-bed is notable. There are three jasper gems, one of which is as fine as any I have ever seen, one each of plasma, sard, gray agate, lydian stone, blue chert and pyrite, and two of chalcedony. All except the pyrite were collected as rough flakes from Indian village sites: the pyrite was from a local coal mine.

COPPER

There is one mineral, a native element, copper, which as a source of material for prehistoric Indian artifacts is of deep interest to the archaeologist. So far as I know, there is no other state that can claim a complete monopoly of production of a single material used by the aborigines in arrow-making except Michigan. The copper weapons, implements and ornaments are found from the Rocky Mountains to the Atlantic Ocean, and from Great Lakes to Gulf: all those of native copper were mined from the

rocks of Isle Royale or the Upper Peninsula of Michigan.¹¹

My own collection has numbered about twenty specimens, ranging from a slender awl or perforator two inches long to a fine knife, and includes also, spear and arrow points, conical beads or pendants, as well as two or three partly worked pieces of the metal. There has been a common belief that the ancient inhabitants possessed a lost art, that of tempering copper, and from time to time there appears in the "news" the report of a discovery of copper knife, spear or other artifact, "so highly tempered that it is unscratched by a file," or "of extreme hardness." More than once I have seen copper objects defaced by file-marks, made by the finder, to test this belief in "a lost art," and in every case, the fiction is finely exposed by the bright scratches left by the file. The facts are simply that the Indians had learned the art of hardening copper by the hammering process: if we take a piece of that metal and beat it on the anvil, it will harden up to a certain point when it will become brittle and crumble. We know that it is malleable, and if at the right point we cease hammering and anneal it, we may again hammer it, and continuing to alternately hammer and anneal, it will be possible to make quite a fair implement, the final hammering leaving it hard enough for the purposes of our primitive man.

Many fictions have grown from very ordinary facts, and "the lost art" mentioned is one of them.

From our present knowledge, it would appear that most of this copper found its way southward by way of the west coast of Lake Michigan, al-

though evidence is accumulating that a large stream came by way of the west shore of Lake Huron, and it was also carried eastward through Georgian Bay and connecting waterways and portages toward the Atlantic coast and southward probably as far as Maryland or Virginia.

It is probable that most of the copper articles found in Lower Michigan, Ohio, and states south and southeastward, came down the west shore of Lake Huron, thence to Lake Erie by connecting waters, or by way of Saginaw Bay and River and tributary streams.

From time to time the question is asked: "How do we know that the copper artifacts found are not from manufactured copper of European origin?" The answer is simple. Michigan native copper is unique in one particular; with one exception, a place in New Jersey where it was probably inaccessible to the aborigines, it contains native silver in specks or patches, the two metals being in close contact, but not in either fused or chemical union. Specimens of this character are known as "half-breeds."¹² While every article made from Michigan native copper may not show silver, it is frequently seen, and if we find a number of such articles, one only showing silver, and plainly of prehistoric manufacture, we are safe in concluding that they are of Michigan native copper, and in many examples they are collected from such situations as to preclude any possibility of European origin.

* * *

Some notable sources of materials.

CHERT

As this paper is an outline of the subject indicated by the title, only a few of the more important sources of

¹¹ Dustin, Fred, *Prehistoric Copper-Mining on Isle Royale, Michigan*. Paper read before Section of Anthropology, Mich. Acad. of Sci., Arts and Letters, March 20, 1936.

¹² Dustin, Fred, *Half-Breeds*, *Oregon Mineralogist*, Vol. II, No. 11, (Nov. 1934).

materials can be mentioned, with perhaps a very brief notice of one or two typical or unique in each class. I have said that chert has a wide range both in use and origin, and perhaps the most unusual specimens of that mineral was obtained from extensive quarries in Union County, Illinois, near a small town named Mill Creek. This quarry is not many miles from both Mississippi and Ohio Rivers, a few miles north of Cairo. Some of this chert quite closely resembles novaculite in color, and sometimes in superficial appearance, being often of snowy whiteness, fine grain, and with the occasional chalcedonic patches seen in novaculite, and if the theories of one or two geologists are correct, it may be at least, a close relation. It has been found well distributed through Southern Illinois and the neighboring state of Missouri.

The characteristic chert, the gray variety, usually of nodular formation, is well represented by that produced in Michigan from the Maxville or Bay Port limestone, outcropping extensively in the vicinity of, and on the islands of Saginaw Bay.¹³ At Bay Port, extensive reefs are found, from which the aborigines were able to secure vast numbers of nodules with little effort, for they were dislodged from the softer limestone by wave and ice action, as well as from the dissolving of the mother-rock. At Point Au Gres, and along the low limestone ridge extending from that point northwest ten or eleven miles with about an equal number of outcrops, the chert was easily obtained from the disintegrating or weathered matrix which held hundreds of thousands of the nodules, although many were worthless for artifacts, having impurities that caused a softness or porosity.

As a rule, the nodules loosened by aqueous action were of better quality than those obtained from the ridge.

Near Nehawka, Cass County, Nebraska, in the extreme eastern part of the state, another type of chert was extensively quarried by the aborigines. Much of it has a dull waxy luster, and the fracture is a well-defined conchoidal, leaving very sharp edges frequently.

The great Flint Ridge Quarries produce chert,¹⁴ but as a large part of the product was too fine to be thus classified, being, at times, an almost pure chalcedony, agate or other gem-like material, it is mentioned only on account of its well-known location and widely distributed product.

QUARTZITE

Quartzite is so plentiful that where chert was scarce or difficult to procure, it was a rather poor substitute for the latter, although in a few localities it approached vein or crystal quartz in appearance, and to a certain extent in fracture. Where it had been formed from a clean, pure silica sand, and the infiltrating silicious waters carried no impurity, an almost transparent stone was formed, and became of value to the red lapidary. It is usually sugar-like in appearance when fairly pure, and possesses a peculiar toughness that has preserved it in river gravels, where other rocks have been pulverized, and often constitutes a large percentage of material forming boulder-beds. Close to, or within the city of Washington, there are great prehistoric quarries "where Cretaceous boulder beds made up chiefly of this material were worked by the prehistoric aborigines."¹⁵ The

¹⁴ Smith, Charles M., *A Sketch of Flint Ridge, Licking County, Ohio*. Annual Rept., Smithsonian Ins. for Year 1884 (1885) pp. 851-873.

¹⁵⁻¹⁶ *Handbook of American Indians*, Vol. 2, pp. 337-338. (W. H. Holmes)

¹³ See work cited in note 2.

massive form of quartzite as used by the Indians, is well represented by the Converse County, Wyoming, quarries, "where . . . outcrops of cretaceous quartzite¹⁶ were worked by the native tribes, and numerous flaking shops where the manufacture of implements was carried on." This particular quarry was described by Dorsey in Publication 51, Field Columbian Museum, 1900: the one in Washington by W. H. Holmes in the 15th Annual Report of the Bureau of Ethnology, 1897.

FELSITE

Mount Kineo, Maine, has already been mentioned as a source of felsite, and perhaps the description by Henry D. Thoreau in *The Maine Woods*, pp. 238-242, is most available. As it is well known, Mount Kineo ascends steeply from the water's edge of Moosehead Lake, and quoting Thoreau: "Jackson, in his Report on the Geology of Maine, in 1838, says of this mountain: 'Hornstone, which will answer for flints, occurs in various parts of the State, where trap-rocks have acted upon silicious slate. The largest mass of this stone known in the world is Mount Kineo, upon Moosehead Lake, which appears to be entirely composed of it, and rises seven hundred feet above the lake level. This variety of hornstone I have seen in every part of New England in the form of Indian arrow-heads, hatchets, chisels, etc., which was probably obtained from this mountain by the aboriginal inhabitants of the country.' I have myself found hundreds of arrow-heads made of the same material. It is generally slate-colored, with white specks, becoming a uniform white where exposed to light and air, and it breaks with a conchoidal fracture, producing a ragged cutting edge. I noticed some

conchoidal hollows more than a foot in diameter. I picked up a small thin piece which had so sharp an edge that I used it as a dull knife, and to see what I could do, fairly cut off an aspen one inch thick with it, by bending it and making many cuts; though I cut my fingers badly with the back of it in the meanwhile."

CRYSTAL OR VEIN QUARTZ

So far as I have been able to find, there is no record of any outstanding quarry of this mineral. Quoting from a reliable authority¹⁷ we read: "White vein quartz occurs very generally along the Appalachian highland, where it was obtained from outcropping veins or from the surface where weathered out and broken into fragments." My friend, Mr. J. E. Scott of Rocky Mount, N. C., (since deceased) sent me many specimens from that region including a quantity of rock crystal and vein quartz, and from others I obtained fine specimens from localities along the mountain ridges of Virginia, the Carolinas, and Georgia. Mr. Scott said that the evidences of prehistoric quarrying and the refuse of workshops were plentiful. Aside from this general statement, I have no information as to specific mines or quarries.

OBSIDIAN

Obsidian is not found in place east of the Rocky Mountains, "but occurs in enormous bodies in Yellowstone Park, in California, and Oregon, and to a lesser extent in Idaho, Nevada, New Mexico, Arizona, and in other western states. The more homogeneous masses of obsidian are easily broken up, and are flaked into desired shapes with less difficulty than any other kind of stone."¹⁸

On account of its accessibility, the great mass of this mineral or rather

¹⁶ See note 15-16.

¹⁷ See page 337 of work cited in note 15.

¹⁸ See page 103 of work cited in note 15.

natural glass, at Obsidian Cliff, Yellowstone National Park, may be mentioned as a great source of material for the prehistoric lapidary.

Quantities of flakes, as well as finished implements and weapons have been discovered in the immediate vicinity.

PITCHSTONE

It seems quite possible that some of the arrow-points and other implements called by collectors and mineralogists obsidian, have been made from pitchstone. While on Isle Royale, I saw two or three arrow-points and collected several flakes and a common scraper of this material, and have seen listed by others, points called by them "obsidian," but knowing that pitchstone is found on the island at Scovill Point as mentioned on a previous page, I think that there is no question as to its identity as the latter mineral. It also occurs on Blake Point in vein-like masses in the amygdaloid on the southern side of the point, and was easily accessible to the aborigines who doubtless made use of it. An arrow-point collected by Dr. Carl E. Guthe on Birch Island, in McCargo Cove, Isle Royale, in a fresh excavation, has the outward appearance of black obsidian.

An interesting question has arisen in my mind concerning the deposit of implements found in the Hopewell Mound near Chillicothe, Ohio, several hundred in number, the origin of which has not been determined. They are reported as being obsidian, the nearest source of which is Yellowstone Park, fifteen hundred miles away. It is not at all improbable that such was their origin, but is it not also possible that they came from Isle Royale? A chemical analysis would likely determine their character, and while pitchstone is found in Colorado, New

Mexico, and Nevada, it is far from plentiful. This is only a suggestion, a possibility, that is of some interest to archaeologist and mineralogist.

NOVACULITE

This interesting mineral is found in great bodies with the Lower Silurian strata in Arkansas. It is especially abundant near Hot Springs. In that vicinity, hundreds of acres of quarries existed, and are surrounded by great quantities of refuse left by the ancient arrow- and implement-makers, both pecked and flaked artifacts having been made, although the leaf-shaped blade which was later specialized into arrow- and spear-points predominated. Unlike most material used by the Indian lapidary, novaculite had a general use, and axes, celts, ceremonial objects and ornaments were fashioned from this peculiar stone. I do not find any record of other important sources of novaculite, and as Hot Springs is so well-known, the archaeologist who visits that part of Arkansas will have a most interesting field for observation and collection.

GEM MINERALS

From the vast numbers of "gem points" collected near the Columbia River in Oregon, we must feel an assurance that a great source of supply must have existed at no great distance. During the last ten years or less, we have learned that Oregon has great stores of agates, chalcedony, and other quartz gem-minerals. While the mineralogist has been busy, and has given us a great fund of information, the archaeologist does not seem to have been as active, for little or nothing has been published as to the sources of those choice little arrow-points which were and still are so plentiful. It is hoped that some one will make a study of this phase of Oregon arch-

aeology, and do for us what the members of the Oregon Mineralogical Society have done for gem and mineral lovers.

While Flint Ridge, Ohio, may be classed as a gem producing locality, it is only incidentally, for the immense quantities of material quarried were of commoner quality. Likewise the rock crystal of the Carolinas came from scattered localities, none of which could be classed of sufficient importance to deserve special mention.

COPPER

It is doubtful if all other materials used by the Indian arrow-maker combined, have caused the interest, discussion, and speculation as has copper. It was not until near the middle of the last century, that definite reports were made of the great prehistoric copper-mines in the Upper Peninsula of Michigan, and until the early 'seventies' of that period, the astonishing works at McCargo Cove, Isle Royale, were undiscovered. Charles Whittlesey¹⁹ in 1863, describes the Upper Peninsula workings. On page 5 of the work cited in note 19, he says: "There are three groups or centers of operation in both cases, one a little below the forks of the Ontonagan River, another at Portage Lake, and a third on the waters of Eagle River. Other works are known to exist, and more will probably be found; but we have probably discovered the most important ones within the district embraced by the map." The map referred to forms the frontispiece to the volume, and covers the entire mineral range from west of the Ontonagan River to the tip of the Keweenaw Peninsula. So far as known, the extensive mining opera-

tions of the last ninety years have completely obliterated the ancient works.

Fortunately for the archaeologist and student, Isle Royale presents grand opportunities for study and research, for there, especially at McCargo Cove, the prehistoric mines remain by hundreds, undisturbed. This place is reached from two or three Keweenaw Peninsula cities, from Duluth, Minn., or Port Arthur, Ont., but as vessels only make regular stops at the resorts, it is necessary to procure private conveyance by boat to McCargo, near the head of which the old pits begin within forty rods of the landing, increasing in number until near the abandoned Minong Mine of the whites, operated in the eighteen-seventies, they are so numerous that they form an almost continuous excavation for nearly a half-mile.

While the literature on this most interesting locality is rather scattered, I have endeavored to summarize the various accounts in a somewhat lengthy paper,²⁰ using my own studies on the spot as a basis. Much remains to be done, and it would seem that the complete excavation of two or three more pits by competent persons might yield data of value, for there has been but little detail work; the various explorers and scientists have been limited by time, or have, like myself, had to cover a wide field in what was only a general reconnaissance of the whole archaeology of the Isle. I have hoped to be able to do some further work, but under present conditions it has been impossible.

The Nationalizing of Isle Royale as a park, may bring government archaeologists to the field, with means to take up the work reluctantly left by

¹⁹ Whittlesey, Charles, *Ancient Mining on the Shores of Lake Superior*, Smithsonian Contributions to Knowledge, p. 135. Published April, 1863.

²⁰ See work cited in note 11.

(Continued on page 213)

NEPHRITE IN WYOMING

No sooner had we announced the discovery of nephrite and jadeite in Washington (April, 1939, issue of *ROCKS AND MINERALS*) than word reached us that nephrite has also been found in Wyoming. The new find was made May 15, 1936, by W. L. Marion and L. B. Curtis, both of Lander, Wyo., on the Sweetwater River, about 60 miles southeast of Lander, in the western part of the state. The occurrence is located in Township 30, North Range 93 West, near Split Rock, in the southeastern part of Fremont County, not far from the famous Sweetwater agate beds. The deposit has been filed by the two partners but so far no serious attempt has been made to work the claim.

The finding of the nephrite was quite accidental. A peculiar mineral of a light green color was picked up at an old prospect hole sunk in serpentine and when later examined was identified as nephrite. The serpentine, as a huge blowout, ran between two aplite dikes at about right angles. This nephrite is much lighter in color than that of the regular deposit and it may be possible that it actually occurs in the serpentine though no search for it in this rock was made and its outcrop does not show it.

The finding of the nephrite, however, really runs back for a period of years. In 1924, when W. L. Marion, was working in a hardware store in Lander, a friend of his who had a reputation as an amateur rock hound, brought to him a beautiful specimen of chrysotile asbestos that he had picked up out in the Sweetwater region. Mr. Marion was asked if the mineral had any value and was told it did if it could be obtained in commercial quantities. The friend offered

to take Mr. Marion to the locality, which offer was accepted, but it was not until 1930 that the trip could be made. Mr. N. H. Brown, a noted paleo-botanist, accompanied the party and though a number of good massive serpentine specimens were collected no asbestos was to be seen. The specimens that were taken back with them polished beautifully and were shown to many friends.

In the spring of 1936, one of the prominent merchants of Lander, decided to remodel the front of his store. It occurred to Mr. Marion that the serpentine might be utilized for this purpose if it could be obtained in large blocks and he decided to investigate the deposit from this angle.

Again Mr. Marion visited the locality, this time accompanied by L. B. Curtis, science teacher in the local high school. It took them two days to relocate the deposit but before it was found they had been over near the Tin Cup Mountain on the Sweetwater River where they investigated a green quartz, resembling aventurine, which has some real merit as an ornamental stone and which can also be used for jewelry settings and pendants.

Among the specimens brought back from the serpentine locality was the greenish mineral, thought to be a variety of serpentine, which Mr. Marion picked up at the prospect hole, as has already been mentioned. This specimen was taken to Biford Foster, a local lapidary, for polishing.

"Where in h—— did you get this?" asked Mr. Foster.

"Out on the Sweetwater," replied Mr. Marion.

"I thought so," said Mr. Foster, "because I was out there a year or so ago with an old man and we also

found a small piece of this type of mineral in the agate beds. The old man told me that he would rather have a 6 inch vein of it than any gold mine and he followed this remark by asking me if I knew what it was. When I hazarded the guess that it was verde-antique, he replied, "yes, I guess it is not. It is jade" I examined the specimen again and more closely, then tried my knife on it—the knife blade would not touch it."

The next day Messrs. Marion and Curtis went back again to the locality but no more jade could be found at the prospect hole nor any where in the serpentine outcrop. But nearby, in a white dike (aplite) jade was actually found in situ. They traced the dike for quite some distance until they came to a saddle on the ridge where Mr. Marion saw a greenish mineral which resembled the green quartz of Tin Cup Mountain.

"Here is some more of the green quartz like that over at Tin Cup," yelled Mr. Marion as Mr. Curtis was about 100 feet away.

"Yes, I see it," yelled back Mr. Curtis, "but, O look at the garnets which I have found," and he rushed over towards Mr. Marion with a handful of them. They were not garnets as their crystal form was different. Later they were identified as corundums.

The jade found is the variety nephrite and it occurs in situ in a huge aplite dike; the aplite is pure white in color with a blue or pink mottling and in itself takes a beautiful polish, resembling marble, and in places has a fibrous texture. The dike is from 50 to 200 feet or more in width possibly a mile in length, and juts above the surface for 50 feet or more. It has a N.E.-S.W. trend.

The nephrite of the deposit is of

two shades of green, olive green and an intense dark green, and each type takes a good polish. In places the nephrite looks like leather that has been burnt and curled up and where it occurs in any amount in the aplite it appears to form seams.

More than 1½ tons of nephrite has been found lying loose in the top soil where it has weathered out of the enclosing rock (aplite) mass. Some of the masses weigh 200 lbs. or more.

No effort is being made to market the nephrite although about two tons of the mineral are in storage in Lander.

Jadeite has not yet been found on the claims but it may be present.

In close proximity to the nephrite dike, there are two ledges of mica schist, carrying corundum crystals (sapphires and rubies). The corundums, when cut en cabochon, show stars, but with two exceptions, they are all flawed. Most of them have a deep purple red color and are of large size, many are almost as large as hen's eggs. The corundum dikes, (60 feet apart and running parallel) are over a mile in length and the crystals occur in concentrations—in some places they are so thick as to defy counting. It was these crystals which had been found by Mr. Curtis who first thought they were garnets.

The corundum dikes are being worked by the partners and at a depth of 7 feet below the surface, the crystals show distinct improvement in color and quality. The work on the corundum deposit consists of open cuts which have reached a depth of 12 feet, but cut through the corundum shoot at 7 feet. The dikes pitch to the east at about 60° or 70°.

If your collection cost you nothing the chances are it is worth nothing.

MINERALS IN THE DOMINICAN REPUBLIC

By DR. WILLY LENGWEILER

Amber

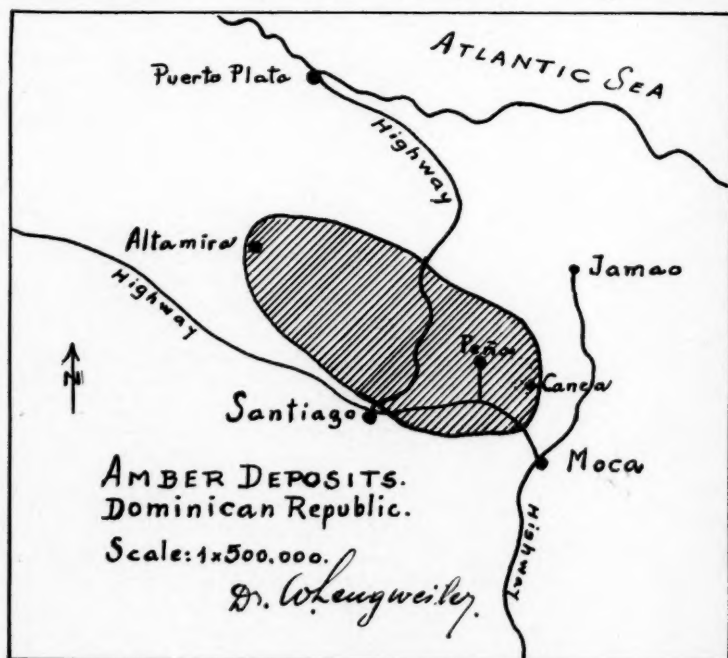
The first discoverer of Amber in the New World was the very Admiral Christopher Columbus, who in one of his letters to Spain wrote about this find and sent samples of it.

Succinite or Amber is an organic product, the fossilized resin of trees, of Miocene age.

In the provinces of the Cibao (Santiago and Puerto Plata), between Altamira and Canca, on both sides of the septentrional mountain range, Amber is found in irregular masses, in beautiful bluish, yellow, greenish and milky colors and seldom brightly orange-colored. Inclosed in this resin are oftentimes small frag-

ments of lignites, leaflets or insects such as mosquitoes, ants, etc.

In the cliffs of the Gurabo River, north of Santiago, Amber is found in situ. Here are miocene strata of bluish sandy clay and below this are thin lenses of lignite, which covers irregular masses of Amber. Below this Amber again comes clay. From this open book of Natural History you can read, that a big forest fell, due to an unknown cause, which was soon covered by sedimentation and as the pressure increased, the sap was squeezed out and imbedded in the lower clay strata, meanwhile the timber carbonized, reducing in thickness.



These cliffs are strongly affected by floods and erosion of the Gurabo River, so pieces of Amber oftentimes are found afloat far from the cited locality.

In the place called La Tarrana, on the southern slope of the Serrazo Hill, exist the remains of a tunnel, which once was opened by an American company in search for Amber. But due to water infiltrations across soft sedimentary strata it crumbled in, as very little timbering was used. Records tell that the company obtained good re-

sults in this mining enterprise, but due to bad management had to abandon their workings.

Transportation of this fossil resin is not difficult, as everywhere near the localities are excellent highways.

It is indeed curious to note in the evening time in these hills, that from every direction a balsamic fragrance floats in the air; natives are illuminating their dwellings, burning Amber.

A small workshop was opened in Pena a short time ago and these people manufacture a lot of objects from this first class Dominican Amber.

COLLECTORS' TALES

By PETER ZODAC

Boss in His Own House

Wilbur J. Elwell of Danbury, Conn., once had occasion to call on a very wealthy collector who was well along in years. During the visit which included an examination of the mineral collection, a large mass of rock containing iolite was observed. The collector, noticing Mr. Elwell's interest in the iolite, offered him a piece of it which offer was accepted. The collector left the room for a few minutes to reappear with a large sledge hammer. Then to the amazement of Mr. Elwell, the collector placed the iolite

mass on an expensive rug in the main sitting room and proceeded to hammer lustily on it.

"Hey, stop" shouted Mr. Elwell, horrified, as chips and fragments flew in every direction, "your wife will give you he--l for doing this."

The collector paused, glared at Mr. Elwell for a second, and blurted out. "I want you to understand that I am boss in this house" and then proceeded calmly to pound away at the rock mass until the required piece was broken off.

Minerals Used By The Indians For Making Arrowpoints

(Continued from page 209)

those of us who have fallen under the spell of that Enchanted Isle; we who have breathed its pure air, drank of its crystal waters, been delighted by its wild life, noted its sub-Arctic flora, and been mystified by its strange tides

and mirages, entranced by its wonderful aurora and awed by its rugged cliffs and deep waters; we who know it in all its moods of sunshine and storm, hope that others may partake of this grand offering of the Great Mother, and that the Isle may be preserved unspoiled for all human time.

A HOMEMADE MINERAL TRIMMER

By **CHARLES R. TOOTHAKER**

Curator, The Commercial Museum, Philadelphia, Pa.

Have you a specimen that is badly shaped, one having ugly corners which you would like to break off? Or have you a specimen you would like to cut in half? You know that if you use a hammer or even a hammer and chisel you are likely to ruin the specimen entirely. Instead of breaking off the end or in half the mineral breaks somewhere else, oftentimes into a number of pieces. We have all had such experiences.

You need a mineral trimmer, a machine with a powerful screw that will force together two chisel edges and break the mineral just where you want it to come apart.

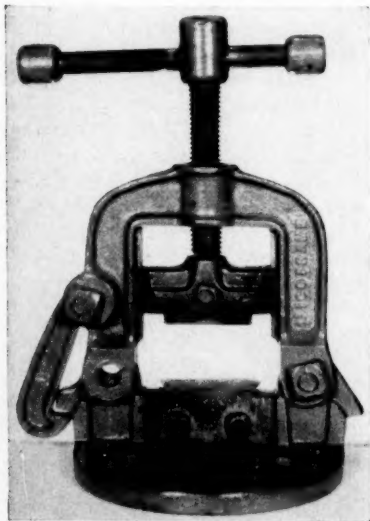
A first-class trimmer is a fairly expensive machine but you can make a perfectly practical one out of any pipe

vise. These vises are sold by hardware stores at reasonable prices and they come in all sizes, from big powerful ones which handle large pipe down to little ones for holding pipe of small diameter. At the bottom of each pipe vise are two jaws with notched teeth. These two jaws are held together by two bolts and there is an open space between the two jaws. If you loosen the bolts, a specially made chisel can be securely held between the jaws by tightening up the bolts. The pipe vise has a single upper jaw when you buy it, clamped at the lower end of the screw. You can remove the upper jaw and substitute for it another specially made chisel and your trimmer is complete.

If you are a good mechanic and skilful at all in metal work, you will need no further explanation.

If you cannot make them yourself, a good blacksmith can forge the chisels for you. They must be of such size and shape as will fit and be firmly held by the jaws of the vise and should, of course, project about three-quarters of an inch or more beyond the clamps to give good clearance for the specimen being broken.

The chisel for the upper jaw must have a hole bored in it for the bolt that holds the clamps together. One of your difficulties will be to get that hole bored through the hard steel. Naturally the quality of steel in your chisels is important. You will be wise to have them made of special steel, at least as good as that in the chisels used by men who cut granite for tombstones. You can perhaps get them made to the proper size and shape and of the right kind of steel by a man



Home-made Mineral Trimmer

who takes care of chisels at some establishment where they make cemetery memorials or at some auto repair shop. Mine were made for me by a teacher of metal work in a manual training high school.

For hard specimens the edges of the chisels should be fairly blunt. For some minerals the edges may be much more acute. For breaking up material for micro-mounts nothing is better than two pieces of a stout butcher knife properly held in the clamps. For a big trimmer to break through a thickness of three inches of fairly hard rock you must have a pipe vise with

a strong, powerful screw. For softer stone, or small specimens, a smaller pipe vise will serve. Do not expect too much of a screw; there is a reasonable limit to its strength.

A trimmer of this character made of a very small pipe vise is a convenient tool for breaking little corners off cabinet specimens and specially for making micro-mounts.

If you will make a trimmer as directed I know you will find use for it frequently and you will wonder as I do now . . . "Why did I never think of this before?"

SPECIMENS OF ARABIAN METEORITE ADDED TO FIELD MUSEUM

Specimens of a meteorite that fell in the heart of the Arabian Desert, and of silica glass formed by the sand which was melted and vaporized by the intense heat it generated, have been added to the department of geology at Field Museum of Natural History, Chicago, Ill., it was announced recently by Clifford C. Gregg, director.

The new specimens are an important addition to the museum's meteorite collection, which is the largest and most complete in the world, states Henry W. Nichols, chief curator of geology. These specimens are pieces of the meteorite which struck with severe explosions near Wabar in the Rub'al Khali, blowing out five huge craters, the largest about 300 feet in diameter. The craters were discovered in February, 1932, by H. St. J. Philby, well-known British explorer, who collected specimens of the meteorite and the silica glass and sent them to the British Museum in London. Wabar is in such an inaccessible region of the desert that it was not

again visited until 1937, when a geologist for an oil company (the California Arabian Standard Oil Company, of Jidda, Arabia) succeeded in reaching the place. He collected there the specimens which now appear in Field Museum's exhibit—a gift to the museum from William Lenahan, an official of the oil company.

The unique nature of the silica glass is perceived only on the closest inspection, and its most remarkable feature can be seen only under a microscope. The stony semi-opaque glass is filled with a multitude of minute bright globules of iron, a thousandth of an inch and less in diameter. This, says Mr. Nichols, can only mean that the heat generated by the impact of the iron meteorite was so great that part of the iron boiled off as vapor, and mingled with the vapor given off by boiling silica from the sand. The silica vapor shielded the iron and prevented its burning. As the mixed vapors cooled they condensed into a rain or mist of iron and silica which formed the silica glass.

BIBLIOGRAPHICAL NOTES

Gems and Gem Materials, by Edward Henry Kraus, Professor of Crystallography and Mineralogy and Dean of the College of Literature, Arts and Science and Chester Baker Slawson, Assistant Professor of Mineralogy, both of the University of Michigan, 3rd Edition, revised and enlarged—287 pages, 344 figures, 4 color plates. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York City, price \$3.50.

It is most gratifying that a continued demand for this very interesting book has made it necessary for a new edition to be printed. In the new and third edition, the book has undergone a thorough revision. Many changes have been made and much new material added, including a chapter on the metals used in gem mountings. Nineteen new illustrations, including four excellent color plates appear while the number of pages have been increased by twenty-seven.

The authors have kept their text as nontechnical as possible because they have prepared it for the gem dealer, amateur lapidary, mineralogist, and collector. In the preparation of this, the third edition, Prof. Kraus visited important gem centers on the Continent and in England, while both authors are in constant touch with cutters and dealers of gems in this country. The result is an extremely reliable reference manual which no gem dealer, cutter, or collector can afford to be without as it describes practically every commercially important gem and gem material.

American Gem Cabochons, by Wm. C. McKinley. Published by Lightner Publishing Co., 2810 S. Michigan Ave., Chicago, Ill.; 77 pages, 7 color plates, price \$1.50.

Wm. C. McKinley is one of our younger collectors and a member of the Rocks and Minerals Association and when his new book came out it did not surprise us very much. For young McKinley is an enthusiastic collector and gem lover who has prepared quite a number of interesting articles on minerals, some of which have been printed in *Rocks and Minerals*. What should be more fitting, therefore, than that he should write a book on his special subject, gems.

American Gem Cabochons is a commendable little book. It illustrates 151 gem minerals in color (cut cabochon) from 21 states. Sixteen of the cabochons were cut from pebbles found in the glacial gravels of Peoria, Ill., the author's city. Each gem illustrated is briefly described and all are from Mr. McKinley's fine collection. A Bibliography of Important Literature on American Gems, Descriptive and Determination Tables (with Plate Index), a very interesting Foreword by Dr. G. Montague Butler, of the University of Arizona, and an Author's Page, complete the remainder of the book.

We congratulate Mr. McKinley upon the successful issuance of his first book and trust that it may have a wide distribution.

The advertising rates in ROCKS AND MINERALS are the highest in the world for mineral magazines. Leading magazines all have high rates.

If a dealer does not advertise in ROCKS AND MINERALS—perhaps he hasn't anything worth advertising.

WE REPEAT OURSELVES

(Continued from page 194)

Do not make the mistake, however, in believing that the only way to make a collection of good minerals is to collect them personally at mines and quarries. Most of us, even the big museums, purchase mineral specimens because it is necessary that good collections embrace specimens from all over the world. It is not possible to visit every important mineral locality personally throughout the world and even when visited you may not find anything of value at that time. Many individuals at important mines and quarries are always on the lookout for choice mineral specimens which they collect and sell to dealers; consequently what is thrown out on the dumps is of the poorer grade which accounts for the reason why it is not always possible to find good material when a personal visit is made to a locality.

"Many good specimens can, nevertheless, be picked up at mines and quarries and visits to them are recommended. Bear in mind, however, that any individual, even the rankest amateur collector, can pick out a good specimen from a dealer's stock because the average mineral dealer carries nothing but the choicest specimens accurately labelled. But it takes a collector of many years experience, one who has handled a large number of specimens and who can recognize many on sight who, on visiting a mine or quarry, can, from the tons of rock thrown out on the dumps—huge masses to tiny grains heaped up in every conceivable fashion and coated with

dust, dirt, leaves or brush—pick out specimens good enough for a collection. These specimens, when brought home, often must be trimmed and washed and then labelled.

"We want to encourage you in making a collection of minerals but we also want you to start out in the right way. We would suggest that you first secure a small assortment of the commoner minerals from a reliable dealer; these specimens will be of good quality and accurately labelled. Study them. Read up on them in a good mineral book such as English's *Getting Acquainted with Minerals*, Hawkins, *The Book of Minerals*, or Dana's *Minerals and How to Study Them*. *Zodac's How to Collect Minerals* is also recommended. Furthermore, subscribe to *Rocks and Minerals*, America's oldest nontechnical mineral magazine, which comes out monthly, to keep you abreast of the times, mineralogically.

"From time to time buy a few good mineral specimens from dealers to add to your collection, ordering the best that you can afford. Visit museums and mineralogical friends to see what they have on display and how arranged and of course make trips to as many localities as you can to see how minerals actually occur in nature and to secure specimens for your collection or for exchange with other collectors or to give to friends so that they can be encouraged to make collections and join you on trips.

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